VEHICLE STARTUP/DRIVING AUTHORIZATION SYSTEM

FIELD OF THE INVENTION

The present invention relates to a vehicle startup/driving authorization system in which a control unit in the vehicle uses an interrogation/response dialog with a portable transponder to check and approve or deny entry to the vehicle and authorization to start up and drive the vehicle by exchanging identification codes. Driver-triggered switching processes, additional switching and/or operating states of monitored vehicle components and a further interrogation/response dialog may be required to enable the startup/driving authorization system.

BACKGROUND INFORMATION

Startup/driving authorization systems are intended to increase anti-theft security in a vehicle because further actions are necessary to enable the vehicle to be started and driven. A vehicle entry authorization system is described in German Published Patent Application No. 35 36 377 A1 that is used primarily as an anti-theft system. In this case, the transponder is used instead of the vehicle key to lock and unlock the vehicle doors.

A startup/driving authorization system is described in, for example, International Patent Publication No. WO 96/28628. The further interrogation/response dialog is initiated by a control unit in the vehicle only if the brake pedal is pressed and the driver is occupying the driver's seat. The second interrogation/response dialog then enables the vehicle to be

started and driven, for which purpose the driver must carry out the necessary switching actions.

European Published Patent Application No. 0 767 092 describes a method of monitoring the use of the seatbelt in a startup/driving authorization system and enabling the vehicle to be started and driven only if a switch provided on the seatbelt has been activated.

German Published Patent Application No. 43 29 697 states that approval to start and drive a vehicle may depend upon operating states, such a placing a gear in neutral.

German Published Patent Application No. 44 24 879 describes that depressing the brake pedal prior to the startup phase may be used as a requirement to indicate the intent to start the vehicle.

In another conventional method, the warm-up period of a passenger car diesel engine is automatically started when the vehicle door is unlocked, i.e. opened, thus noticeably reducing the warm-up time for the driver. This method has at least one disadvantage in that the power-intensive warm-up can be initiated even if the driver does not intend to start the car. Furthermore, the ignition key must still be inserted into the ignition lock and started manually.

For safety reasons, an increasing number of locks are being provided in a vehicle to block functions that are assigned when the vehicle is stopped but which are necessary to start and drive the vehicle. Reference here is made only to locking the steering column, power transmission, and gear train which must be released prior to starting and/or driving the vehicle. These locks increase the difficulty in operating conventional startup/driving authorization systems.

SUMMARY OF THE INVENTION

Another object of the present invention is to incorporate the above-referenced locks into a startup/driving authorization system without increasing the difficulty of using the system when starting and driving the vehicle.

This object is achieved according to the present invention in that, after vehicle entry has been approved, using the further interrogation/response dialog triggered within the vehicle, an automatic initiation of preliminary startup procedures and release of legally required locks for the steering system, power transmission, and/or gear train are provided.

The further interrogation/response dialog is also used to automatically trigger the legally required locks so that the driver does not have to manually perform these operations, while the further interrogation/response dialog increases the security of the authorization system.

In one embodiment, it is not permission to enter the vehicle granted by the vehicle entry control system that initiates preliminary startup processes, such as engine warm-up or unlocking the steering wheel/steering column or gear train lock, but rather a second authorization check inside the vehicle. Primarily "handsfree ignition" driving authorization systems, in which the presence of a licensed transponder provided in a specific location inside the vehicle is sufficient to verify authorization—i.e. eliminating the need to mount a transponder in a defined holding device—are thus placed in compliance with applicable licensing regulations.

The authorization check can be conveniently initiated, for example, by having a seat occupancy switch determine that a person is occupying the driver's seat, using a trigger

function dependent on a minimum weight or other facilities. Only after the driver's seat switches from an unloaded to loaded, i.e. from an unoccupied to occupied, state does a second authorization check occur, thus triggering preliminary startup procedures, such as engine warm-up and release of the steering or gear train lock, so that the driver can start the car manually. It is therefore not necessary to provide a specific trigger action, such as inserting the transponder into a holding device.

At least in some countries, the law requires that the driver intentionally initiate the actual startup procedure, i.e. supplying power to the starter. Because handsfree ignition systems eliminate the need to insert the transponder into a reader functioning as an indicator, a starter switch can have any design suitable for its purpose. If a regulation of this type does not apply, all procedures needed to start the vehicle engine can take place after identification even without being triggered manually, provided that security-related information is provided.

To prevent unauthorized persons, for example children sitting in the passenger's seat, from starting the engine—particularly in the case of handsfree ignition systems—when a transponder is simultaneously provided in the predetermined location inside the vehicle, for example in a handbag on the driver's seat, additional signals must be transmitted at the latest at the end of the warm-up period in the case of diesel engines and immediately in the case of gasoline engines, indicating that a living person, and not merely a sufficiently heavy object, is indeed sitting in the driver's seat. Signals of this type suitably include, in particular, dynamic activation of frictionally separating or travel-inhibiting devices (such as the clutch or brake pedal), as well as static information such as the gear train neutral or parking position, activated parking brake, or activated seat belt lock. Dynamic processes

are advantageously included to detect an intent to start the engine. These are operations that must take place at a certain point. The purpose is to prevent, for example, stuck pedal switches from supplying necessary, yet incorrect, information.

In addition, a locked steering wheel or steering column of the gear train or power transmission system must be released, and therefore its status also detected, before starting the engine.

If these signals are detected at the times specified by the system, power is supplied to the starter without any further action on the part of the driver, for example reactivating the starter switch, and all voltages needed to operate the engine and vehicle are provided.

In the case of diesel engines, the starting procedure can be advantageously designed so that the clutch or brake pedal does not have to be held down for the entire variable duration of the warm-up period, but rather only within a certain period after the end of warm-up, which can, for example, be indicated visually (control lamp in the instrument panel). Likewise, the driver can be given other information, e.g. acoustically, indicating a possible startup time or duration or providing instructions.

At the end of this period, depending on the system design and requirements of the vehicle manufacturer, only the vehicle circuit needed for a stationary vehicle can remain closed, for example, for a radio, clock, central locking system, etc. Another warm-up and startup procedure then requires the starter switch to be activated again or, where permitted, other indicators can be activated (such as a brake pedal or clutch). This prevents unnecessary idle currents.

Reinitiating the startup procedure according to each of the methods described above is suitably associated with a new interrogation to determine the presence and identification of a licensed transponder. This can further increase security each time the vehicle is driven.

To avoid unintentional or random activation, a minimum actuation duration and a minimum setting force as well as a suitable method of attachment is recommended for starter switches.

To avoid a multiplicity of controls, and thus control processes, the starter switch can also be used to shut down the engine. Its effect at any given time can be switched as a function of engine speed. For example, it can have a starting function at speeds below idle speed and a shutdown function at speeds equal to or higher than idle speed.

Other methods for shutting down the vehicle engine include both manual and automatic shutdown. For example, the engine can be shut down upon reaching idle speed and an operating speed of 0 km/h, provided that the clutch is operated once or more consecutively without putting the car in gear and if no transponder is located inside the vehicle, or in automatic transmissions the P position is engaged.

BRIEF DESCRIPTION OF THE DRAWING

The Figure is a schematic view of a startup and driving authorization system according to the present invention.

DETAILED DESCRIPTION

The Figure shows a schematic representation of a startup and driving authorization system, using a transponder TP with a transmitter part St and a receiver part Et, which can communicate with a transmitter Sf and a receiver Ef—both located in the vehicle—over a wireless communication channel KK. Depending on the system, this communication channel KK is used not only to transmit the messages needed to check the transponder identity, but also to transmit power from the vehicle to the transponder, if necessary. The driver receives relevant information on a display unit IG. Locking elements SE for the steering column or other vehicle components approved for locking purposes to protect against unauthorized use are illustrated as a block.

To increase security, an interrogation/response dialog is advantageously used for interrogation, varying in an unpredictable manner with each interrogation. If a dialog of this type is also used for vehicle entry control, and if a second security check is requested before activating the starter switch, both dialog procedures can have different identification characteristics to protect against decryption.

It is possible for the startup and driving authorization control check to be controlled independently of the vehicle entry system, for example using the seat switch in driver's seat FaS or other suitable devices not illustrated here. Another identification procedure can be performed upon reinitiating the startup process by activating starter switch SS or another device provided for this purpose. This prevents unauthorized persons from being able to start the engine.

Approval to start the engine is then granted when starter switch SS has been activated and, in addition to the prior

successful identification, components such as brake pedal BrP, seat belt lock SiG, gear train GeT, the seat switch in driver's seat FaS and locking elements SE have been activated or reached states that satisfy the security requirements. Monitoring unit ÜW, which collects and evaluates this information, can also be integrated into control unit SG, with the control unit SG being suitably connected to other operation-specific vehicle components, such as for example, engine controller MG or gear train controller GS. In particular, operating parameters, such as vehicle speed, or engine parameters such as engine speed are important information for controlling the startup or shutdown procedure automatically.

As one important precondition, a required locking element SE for protecting the vehicle against unauthorized use, such as a steering wheel lock, must be released prior to authorizing processes that lead directly to engine startup, supplying power to the starter, for example.

Once all preconditions have been met, the manual portion of the startup procedure is automatically initiated and runs until the engine starts. If one or more of the preconditions is not met, neither the starter nor engine controller MS can go into operation.

To protect the starter, the power supply period is limited. This can be accomplished either by engine controller MS itself or by a special function unit (not illustrated) inside or outside control unit SG by monitoring engine speed or by specifying a maximum time.

Display unit IG provides the driver with a visual, acoustic, or other form of indication of the relevant system states, for example warm-up in the case of diesel engines.

The present invention is not limited to the additional startup/driving release and automatic startup conditions described above. The authorization procedure can also include additional prerequisites or vehicle component operating states, switching actions, and transponder data to increase security.

Instead of a transponder-supported identification system, the driver can also be identified biometrically, for example, by checking one or more fingerprints, voice, iris, face profile, etc. Fingerprint or hand-profile recognition systems, in particular, can make the startup procedure very easy and convenient, since detection of the fingerprint or hand profile can coincide with the activation of controls that start the engine, provided that these elements include corresponding facilities. In the case of voice control and voice identification systems, the request to start the engine can be expressed in the form of a spoken command. By providing the microphones in a suitable location, it is possible to simultaneously determine whether the speaker is sitting in the driver's seat, provided that suitable microphone properties are selected.